

THE DISTRIBUTION OF THE BEACH-GRASSHOP-
PERS *TRIMEROTROPIS HURONIANA* AND
TRIMEROTROPIS MARITIMA INTERIOR
IN THE GREAT LAKES REGION
(ORTHOPTERA: ACRIDIDÆ)¹

BY T. H. HUBBELL

A number of years ago Mr. Sherman Moore, of Detroit, sent me three specimens of a grasshopper which he had taken on the beach of Horseshoe Bay, five miles north of St. Ignace, Mackinac Co., Michigan. It was with considerable interest that I recognized the species as *Trimerotropis huroniana* E. M. Walker, described from Southampton, Ontario, in 1902, and not reported since that time. Since the finding of these first specimens, the species has been taken in a number of localities along the shores of the northern Great Lakes, and in 1925 I reported it in a preliminary way from several counties in Michigan.

Since the Great Lakes race of another species of the genus, *Trimerotropis maritima interior* E. M. Walker, is also found in the region, it became an interesting problem to determine the limits of distribution of the two, especially as certain records of the latter species seemed to indicate an overlapping of their ranges, while other facts pointed to a replacement of one species by the other in their respective territories. Recently I have had the opportunity of studying and rearranging the large collection of Michigan Orthoptera in the Museum of Zoology of the University of Michigan, and in the course of this work I found it necessary to examine all the material of this genus contained in the collection. When this was done it became evident that there had been some confusion of the two species, and consequent misunderstanding of their distribution.

All of the material recorded below is in the above mentioned collection, with the exception of two specimens in the collection

¹ Contribution from the Department of Biology, University of Florida, Gainesville, Florida.

of Mr. Sherman Moore and one in that of the Michigan State College.

Trimerotropis huroniana E. M. Walker.

1902. *T. huroniana* E. M. Walker, Can. Ent., xxxiv, 6, figs. 8-13 [Southampton, Ont.]
 1911. *T. maritima* var. *interior* Shull, Publ. 4, Biol. Ser. 2, Mich. Geol. & Biol. Surv., 226 [Sand Point, Huron Co., Michigan].
 1920. *T. huroniana* Blatchley, Orth. Northeastern Amer., 298 [Southampton, Ont.].
 1920. *T. maritima* Blatchley, l. c., 294 (in part) [Huron Co., Michigan].
 1925. *T. huroniana* Hubbell, Florida Ent., ix (3), p. 44 [Schoolcraft, Mackinac Emmett, Charlevoix, Leelenau and Grand Traverse Cos., Michigan].

MICHIGAN: Port Austin, Huron Co., Aug. 26-27, 1924 (F. M. Gaige) 8 ♂, 6 ♀; Sand Point, Huron Co., July 6-Aug. 3, 1908 (A. F. Shull) 2 ♂, 7 ♀;² Harrisville, Alcona Co., Aug. 10-15, 1921 (F. M. Gaige) 9 ♂, 13 ♀; Big Stone Bay, Emmett Co., July 30, 1921 (Hubbell) 10 ♂, 12 ♀; July 30, 1927 (H. B. Baker) 1 ♂; Cross Village, Emmett Co., Aug. 2, 1924 (S. Moore) 1 ♂; Norwood twp., Charlevoix Co., Aug. 6, 1923 (Hubbell) 1 ♂, 5 ♀; Hog Island¹, Charlevoix Co., July 26-28, 1921 (Hubbell) 9 ♂, 21 ♀; Beaver Island, Charlevoix Co., Aug. 2, 1922 (S. Moore) 2 ♂, 1 ♀; Leland, Leelenau Co., July 30, 1921 (R. T. Hatt) 1 ♀; North Fox Island, Leelenau Co., Aug. 2, 1922 (S. Moore) 1 ♂, 1 ♀; Marion Island, Grand Traverse Co., July 25, 1923 (Hubbell) 3 ♂, 1 ♀; Traverse City, Grand Traverse Co., 1 ♂ (Coll. Mich. State Coll.); Horseshoe Bay, 5 miles north of St. Ignace, Mackinac Co., July 11, 1920 (S. Moore) 3 ♂ (2 specimens in Coll. S. Moore); July 24, 1921 (Hubbell) 39 ♂, 45 ♀; Naubinway, Mackinac Co., July 8, 1921 (S. Moore) 1 ♂, 1 ♀; July 29, 1921 (Hubbell) 2 ♂, 4 ♀; Manistique, Schoolcraft Co., July 25-26, 1922 (S. Moore) 3 ♂, 1 ♀; Whitefish Point, Chippewa Co., July 21-27, 1914 (W. S. McAlpine) 1 ♂, 1 ♀.

It is evident that this species replaces *Trimerotropis maritima interior* on the northern shores of the Great Lakes, though its limits of distribution are as yet little known. In the region of

² These specimens are the basis of Shull's 1911 record of *T. maritima* var. *interior*.

the Straits of Mackinac *Trimerotropis huroniana* is everywhere abundant on the sandy lake beaches. From this region it extends southward along the west shore of Lake Huron at least as far as the tip of the "thumb"; on the Ontario shore it occurs at Southampton, and probably northward throughout the Georgian Bay region and along the north shore to the Straits. *T. huroniana* follows the north shore of Lake Michigan west of the Straits of Mackinac at least as far as Manistique, is found on the islands in the northern end of the lake, and extends down the Michigan shore as far as Leland and Traverse City, and probably beyond. Additional field work is needed to determine whether the ranges of *T. huroniana* and *T. maritima interior* meet on the Lake Michigan shore, and if so, at what point. North of the Straits region the species reaches the eastern end of Lake Superior (Whitefish Point); how far it follows the beaches of this lake is not known. Hebard did not find it in Baraga county, nor did I encounter it on the shore of Lake Superior near the Huron Mountain Club in Marquette county.

The habitat of *Trimerotropis huroniana* on Hog Island, in northern Lake Michigan, is typical of the situations in which it occurs in the Straits region. At this locality it was found to be abundant on a quarter-mile stretch of somewhat protected sandy beach, at the head of a small bay on the west shore of the island. On either side the sandy shore gave place to beaches of sharp shingle, where the species did not occur; nor have I found it elsewhere under such conditions. At the head of the bay the bare sand of the lower beach slopes upward from the strand-line to a slight ridge, which supports an irregular growth of sand willows, beach cherry, and beach grass. Between this zone and the edge of the forest the upper beach is covered with a scattered growth of grasses and xerophytic herbage, which gives place along the shoreward margin to mats of bear-berry (*Arctostaphylos uva-ursi* (Linn.), and *Juniperus horizontalis* Moench., and clumps of *Juniperus communis siberica* Burgsd., the two latter forming a low marginal thicket at the edge of the forest of white cedar, white spruce, birch and a few other trees.

Trimerotropis huroniana was found in greatest numbers on the dry sand among the scattered grasses, herbage and shrubbery of

the upper beach, although occasional specimens were found to the edge of the strand. The species is very alert, but seldom flies far, and is more easily captured than *T. maritima interior*. Its stridulation is not loud; it is well described by Walker. Associated with *T. huroniana* on the beach at Hog Island were the following species of Orthoptera: *Acrydium acadicum acadicum* (Sc.) (scarce on upper beach), *Nomotettix cristatus cristatus* (Sc.) (scarce on upper beach), *Chorthippus curtippennis curtippennis* (Harris) (scarce), *Dissosteira carolina* (Linn.) (scarce), *Circotettix verruculatus* (Kirby) (numerous), *Camnula pellucida* (Sc.) (abundant), *Melanoplus mexicanus mexicanus* (Sauss.) (abundant), *Melanoplus femur-rubrum femur-rubrum* (DeG.) (scarce), *Melanoplus confusus* Sc. (scarce), *Melanoplus keeleri luridus* (Dodge) (scarce), *Melanoplus fasciatus* (F. Walker) (scarce), *Melanoplus islandicus* Blatchley (a few in the marginal thicket of Junipers), *Scudderia pistillata* Brunner (on shrubbery of upper beach), *Gryllus assimilis* (Fabr.) (common under beach debris), *Nemobius griseus* E. M. Walker (moderately common on upper beach, especially in the Juniper thicket). In a similar situation at St. Ignace the following additional species were taken with *T. huroniana*: *Scirtetica marmorata marmorata* (Harris), *Melanoplus packardii stonei* Rehn, and *Conocephalus fasciatus fasciatus* (DeGeer). In this locality a male *Trimerotropis huroniana* was taken in copula with a female *Circotettix verruculatus* (Kirby); the pair is mounted in this position. Such cases of miscegenation are not uncommon in the Acrididæ, and seem to be somewhat more frequent among the Oedipodinæ than in the other subfamilies.

The general facies of *Trimerotropis huroniana* is usually quite different from that of *T. maritima interior*. In most instances they are easily separated by color characters alone, but occasional specimens show a close superficial resemblance to the other species. The tegmina of *huroniana* vary from a banded type, with dark, rather solid fasciæ contrasting distinctly with the light ground color, through various intermediate conditions, to those of a uniform brownish or grayish color. Specimens with the latter type of coloration sometimes resemble *T. maritima interior* in appearance; but in *huroniana* the tegmina nearly always

retain traces of the solid proximal band and usually of the the median band, while in *maritima interior* the base of the tegmen is seldom noticeably darker than the mesal portion, the proximal band being narrower and scarcely suffusing the base. Uniformly colored individuals of *huroniana* are frequently of a bright ferruginous color; such individuals would scarcely be taken for the same species as others of the paler, contrastingly-banded type. All variations of color and pattern are usually represented in the same restricted area of beach, and among mating pairs the two insects are as often of different as of similar coloration. In this species the disk of the wing is a more dilute yellow than is the rule in *maritima interior*, and it has a faintly more greenish hue than in that species. The wing band is seldom as dense as in the more recessive condition of *maritima interior* found on the shores of southern Lake Michigan, and never approaches the deep black of typical examples of that race from Ontario; frequently it is merely infumate. Furthermore it is relatively narrow (though the width varies considerably), and often interrupted or narrowed anteriorly, resembling in this respect the more recessive examples of Lake Michigan *maritima interior*; in the typical condition of that race it is almost uniformly broad and continuous. The most constant color difference between the two species is found in the lower sulcus of the caudal femora; in *huroniana* this is typically black, with one pre-apical light band, in *maritima interior* light with two black bands. In occasional specimens of *huroniana*, however, the black suffusion is weakened until the condition resembles that found in heavily suffused examples of *maritima interior*. Another more variable color character has been used by Blatchley in his key to the eastern species of the genus—the coloration of the internal surfaces of the geniculæ of the caudal femora; in *huroniana* these are usually dark, and in *maritima interior* usually light in color, but the reverse is true of some specimens of *huroniana* from Hog Island, Harrisville and St. Ignace, and of all the material of *maritima interior* recorded below from Goderich, Ontario.

The structural characters separating the two species are less variable and more to be relied upon in exceptional cases. The antennæ of *maritima interior* are distinctly longer and heavier

than those of *huroniana*; and the fastigium of the vertex, while somewhat variable in form, is noticeably longer in the latter species. The most characteristic difference is found in the structure of the pronotum. In *huroniana* the prozona is more compressed, and the anterior prozonal lobe is noticeably longer and slightly more elevated than the posterior; both lobes rise distinctly above the plane of the metazona. In *maritima interior* the dorsum of the prozona is lower and more rounded, and appears somewhat longer in proportion to the metazona; the two lobes of the prozona are almost equal in length, of about the same height, and but little elevated above the plane of the metazona. Walker's description and figures of *T. huroniana* are excellent, and illustrate most of these points.

Trimerotropis maritima interior E. M. Walker.

1898. *T. maritima interior* E. M. Walker, Can. Ent., xxx, p. 262 [Toronto and Kingsville, Ontario].
 1920. *T. maritima* Blatchley, Orth. Northeastern Amer., 293 [In part].
 1922. *T. maritima* Hubbell, Occ. Pap. Mus. Zool. Univ. Mich., No. 116, 45 [Berrien Co., Michigan].

ONTARIO: Goderich, Huron Co., July 26, 1921 (A. W. Andrews) 1 ♂, 4 ♀.

MICHIGAN: St. Joseph, Sawyer Dunes, New Buffalo, Berrien Co. (previously recorded); Port Huron, St. Clair Co., summer 1921 (A. W. Andrews) 1 ♀; Monroe, Monroe Co., Aug. 18, 1922 (C. L. Hubbs) 1 ♂.

The typical race of this species is found along the Atlantic coast from Pine Point, Maine (Morse) south to Atlantic Beach, Florida (Rehn & Hebard). The status of Walker's race *interior* is at present somewhat doubtful. It was described from localities on the north shores of Lake Ontario and Lake Erie, and has since been recorded from additional localities on these lakes, from Walpole Island, St. Clair River, and from near Sarnia, at the southern extremity of Lake Huron. The series recorded above from Goderich and the specimens from Port Huron and Monroe are typical of this race, having broad solidly black wing-bands, and being smaller than Atlantic Coast specimens.

Westward *Trimerotropis maritima* is abundant about the southern end of Lake Michigan, having been recorded from

Michigan (Hubbell), Indiana (Blatchley) and Illinois (McNeill); Blatchley has taken it on the shores of small lakes in northern Indiana, and *Somes*³ states that it is found on the sandy flats of the Mississippi River in southern Minnesota. I have seen only Lake Michigan specimens from this portion of the range of the species, and cannot say whether the Minnesota specimens agree with them or not. Lake Michigan specimens, at any rate, are not typical of race *interior*, but apparently are intermediate between the condition found in that race and the typical condition. While the Ontario specimens recorded above have the wing band uniformly broad and densely black, in the Lake Michigan material, which is quite variable, it averages narrower and less densely colored, and in nearly all the specimens is distinctly narrowed or entirely interrupted caudad of the subcostal taenia. Occasional specimens from this region are scarcely separable from Atlantic Coast material. However, I am regarding all the specimens from the Great Lakes region as *Trimerotropis maritima interior* for the present, since the coloration averages more intensive, the size somewhat smaller, and they present in general a recognizable facies distinct from that of Atlantic Coast specimens.

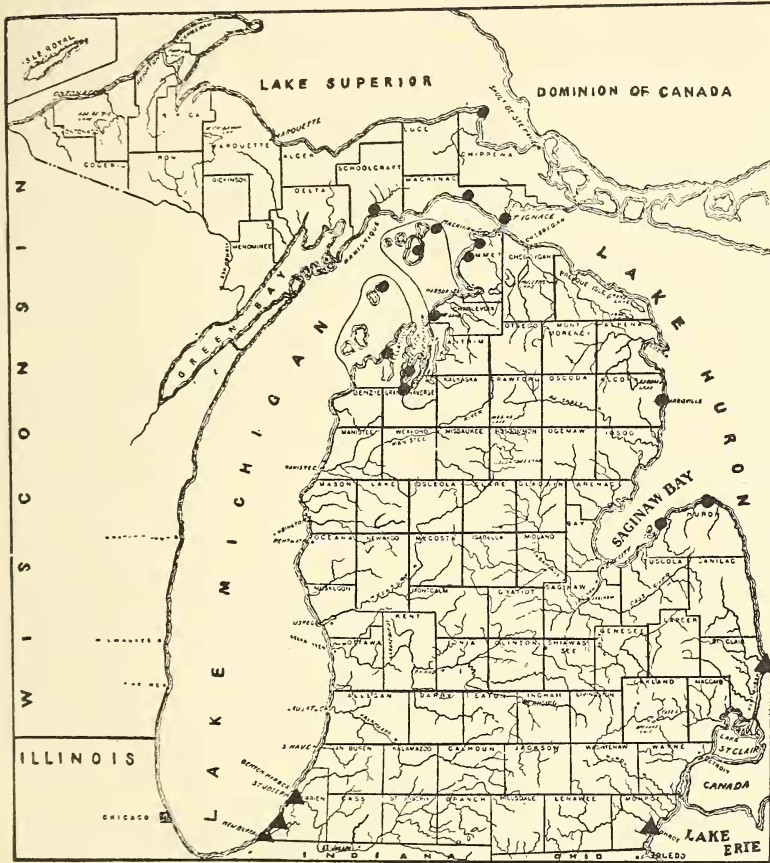
Reexamination of the material shows that Shull's record of *Trimerotropis maritima* var. *interior* from Sand Point, Huron Co., Michigan, on the authority of A. P. Morse, is instead referable to *T. huroniana*. The specimens are typical of the species except for the unusually elongate wings of a few of the females. They are light colored, of the unbanded phase, and somewhat resemble the other species; the ease with which the two may sometimes be confused is shown by the fact that so careful a worker as Rehn examined part of the material in 1919 and confirmed Morse's determination.

Blatchley repeats this record, and gives, on my authority, the additional locality of Chippewa county, Michigan. Reexamination of the material shows that it is correctly determined, but I believe the locality to be erroneous. The record is far north of all others for the species; furthermore, Mr. W. S. McAlpine collected two specimens of *T. huroniana* at the locality from which

³ *Somes*, M. P. 1914. Bull. Div. Ent. Minn. Agr. Exp. Sta., No. 141, 60.

these are supposed to have come. This record was based on two specimens given to the University of Michigan Museum by Mr. A. W. Andrews, of Detroit; they bore colored labels which indicated that they had been taken on the shore of Lake Superior at Whitefish Point, Chippewa Co., Michigan, in 1914. At the time when they were given to the Museum Mr. Andrews had also collected on the shore of Lake Michigan in Berrien county, and I believe the specimens were probably taken in that locality. They agree with other Berrien county material at hand, except that the coloration is unusually light, and the wing-bands fainter than usual, so that they might well be referred to the Atlantic Coast race; Rehn saw them in 1919 and stated that they were apparently typical *maritima*.

From the data available the distribution of *Trimerotropis maritima interior* may be summed up as follows: it is a race (?) characteristic of the southern portion of the Great Lakes district, being entirely replaced to the north by *Trimerotropis huroniana*. In the eastern part of its territory it is typical, occurring along the shores of Lake Ontario and Lake Erie, and following the Detroit River, Lake St. Clair and the St. Clair River to the southern end of Lake Huron. On the Ontario shore of this lake it extends northward to a point between Goderich (the northernmost known locality in this region) and Southampton, where *T. huroniana* is known to replace it; on the Michigan side of the lake it does not reach the tip of the "thumb," as all of the Huron county material belongs to the other species. *Trimerotropis maritima interior* reappears again on the southern end of Lake Michigan in an atypical recessive condition, and has a discontinuous distribution along the sandy shores of lakes and large rivers westward to southern Minnesota. The extent of its northward distribution on the shores of Lake Michigan is not known.



The Michigan records of *Trimerotropis huroniana* E. M. Walker (circles) and *Trimerotropis maritima interior* E. M. Walker (triangles).